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The Alsónyék story: towards the history of a persistent place

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Aims and scope of this paper

The papers presented above in this volume have provided formally modelled date estimates for the development of Alsónyék, phase by phase, from the Starčevo to the Lengyel period. In this final discussion paper, we now aim, first, to bring together all the chapters of the long story into a single narrative, and to attempt a detailed interpretation of its long persistence, which is of a kind so far rather unfamiliar in prehistory. That enables us, secondly, to discuss the Alsónyék story in more interpretive terms, in relation to notions of persistent place, community, aggregation and coalescence, and with an eye on the broader tempo of change. In doing this, we will tack between the site-specific evidence from Alsónyék and wider comparisons from ethnography and recent history, far beyond Transdanubia in both time and space. Thirdly, we will use our formally modelled date estimates from the Lengyel period at Alsónyék to trace the intensity of occupation and of the trajectory of population increase and decline at the site. In discussing the dramatic growth of the settlement in the Lengyel period, we will also, finally, consider some of its possible causes and conditions, but this has to be seen in the context of the ongoing post-excavation research of the Alsónyék project, in which it is important to underline that many basic analyses still remain to be completed. We will end, nonetheless, by looking ahead to key research questions for the future.

General conditions of early ‘village’ emergence

In what conditions do people choose to live for the first time in clustered settlements, which for the sake of convenience, though well aware of the implications that any one term can bring, we can call villages? Various preconditions have been suggested, including intensifiable food production, relatively permanent residence and political autonomy (BANDY / FOX 2010b, 3–4; CARNEIRO 2002), with population growth of various possible kinds (BOCQUET-APPEL 2008;

BOCQUET-APPEL ET AL. 2014; WINTERHALDER / LESLIE 2002) also relevant. Those perhaps do not determine the choice of people to live cheek by jowl, rather than say in closely connected networks of smaller social units, in dispersed hamlets, homesteads or other arrangements. More positive reasons have been listed by Wilshusen and Potter (2010, 167–72), in a study based on the Mesa Verde region of the American Southwest, in conditions of migration and rapid population growth in the eighth century AD. Living together in numbers offered a new set of social and economic options, new cultural identities, safety in numbers, a perception of security, a sense of stability, the formalising of property rights, social integration (through shared feasting and ritual) and the suppression of factionalism. In this context, there was an unavoidable balancing act between the failure to defend against the threat of violence and the social and political risks of having too many different people living in a single place (WILSHUSEN / POTTER 2010, 172).

Living together is not just about the numbers of people, but involves the creation of community. The symbolic and affective dimensions of community may be complicated and at times contradictory. Some writers have referred to the general entanglements of close living (HODDER 2012, 186–9; 2013) and the assemblages of people, animals and things which communities may represent (HARRIS 2013; 2014). Community also has to be worked at (BIRCH 2013b, 8; CANUTO / YAEGER 2000), and may be riven with difference (COHEN 1985; HOGGETT 1997); it can be fragile (AMIT 2002). The disadvantages of close living are a recurrent theme, with tensions between, for example, the interests of individuals or kin groups and the ethos of community, the values of generosity and the impulse to aggrandisement, or corporate ceremony and esoteric knowledge (PLUCKHAHN 2010, 100). Social tensions can be mitigated or managed through shared practice, as already noted, or through authority figures and institutions (PLUCKHAHN 2010, 102). But it can never be assumed, beyond the natural limits of growth (BANDY / FOX 2010, 13–15, and references), that community will hold together for long (BANDY 2010, 23). The breaking up and relocation of substantial villages are reported in various situations among the Iroquois after only 10–15 years (CREESE 2012, 368) or 15–30 years (BIRCH / WILLIAMSON 2013, 153–4). Early Mesa Verde villages have been called ‘social tinderboxes’, which rarely lasted beyond 30–70 years or one–three generations (established with precision through dendrochronology) (WILSHUSEN / POTTER 2010, 178). In that particular context, the closing and abandonment of villages were normally deliberately carried out in a variety of ways, from simply walking away to burning (WILSHUSEN / POTTER 2010, 178–9).

Transdanubia and beyond: sequence and growth

Sequence and growth: the wider picture in central and western Europe

Substantial, clustered settlements should not be taken for granted. In the sixth millennium cal BC and in the first half of the fifth, over a much wider area beyond Transdanubia, there was very considerable diversity of settlement forms. In brief outline, many occupations of the Starčevo and Körös cultures of the first half of the sixth millennium cal BC may have been individually relatively small, though dispersed quite abundantly along river courses to form populous landscapes, as opposed to single sites (KOSSE 1979; KALICZ 1990; BÁNFFY 2004; 2014; ANDERS / SIKLÓSI 2012). In Transdanubia itself, an important distinction can be made between the area of the Drava–Danube confluence, the last zone resembling the landscape to the south, and the much hillier and forested setting stretching up the marshy edges of Lake Balaton (BÁNFFY / SÜMEGI 2012), within which we envisage Starčevo communities having to make considerable adaptations. Only low numbers of Starčevo settlements are known, and the normally small scale of excavation of both Starčevo and Körös occupations should be remembered. Very few have been well dated, the probable span of Ecsefalva 23 being estimated as 70–80 years (BRONK RAMSEY ET AL. 2007, 177). LBK settlements of the second half of the sixth millennium cal BC in central Europe as a whole ranged from small groupings of longhouses to much larger nucleations; debate continues about the duration of individual longhouses, but it seems that some of the larger locales were inhabited, perhaps continuously, for many ‘house generations’ (such as Langweiler 8 or Bylany: LÜNING 2005; PAVLŮ 2000), with further examples from the western Carpathian Basin, such as Štúrovo and Balatonszárszó (PAVÚK 1994; OROSS 2013a).

Although tell sites emerged further south, within the Karanovo I-Kremikovci-Anzabegovo-Vršnik orbit, in the central and southern Balkans, and also in Macedonia and Thessaly, at the beginning of Neolithic (RACZKY 2015, 240–2), the latter part of the sixth millennium cal BC saw the emergence of the first tells in the northern Balkans, and tell mounds began their life also in the southern part of the Great Hungarian Plain, in the late Szakálhát phase and in the earliest Tisza culture (KALICZ / MAKKAY 1977; RACZKY ET AL. 1985, RACZKY 1987). This form was to continue until the middle of the fifth millennium cal BC (LINK 2006; PARKINSON ET AL. 2002; 2004). In the first half of the fifth millennium cal BC in particular, there was considerable diversity of ‘flat’ settlement, from some large nucleations in the Vinča, Lengyel and Tisza-Herpály cultural orbits, in the latter cases very often in conjunction with tells (as at Csőszhalom: RACZKY / ANDERS 2010; NEUMANN ET AL. 2014), to smaller nucleations in the post-LBK constellations to the west; small and short-lived longhouse ‘hamlets’ of the Villeneuve-Saint-

Germain group in the Paris Basin (BEDAULT 2009) could perhaps serve as the other end of the spectrum of site sizes.

The evidence from Hungary

Against this general background, one could argue for generally steady development and growth of Neolithic settlements in both western and eastern Hungary, from the early sixth millennium cal BC to the middle of the fifth. LBK and Alföld LBK sites were not obviously smaller than Starčevo or Körös ones. The small-scale excavations of the past might encourage the view that they were often broadly comparable in size (KALICZ / MAKKAY 1977), but Körös sites can be both large and can contain enormous quantities of material, and none have yet been extensively or fully excavated. Newly discovered LBK and Alföld LBK sites like Balatonszárszó and Tolna-Mözs in Transdanubia and Füzesabony and Mezőkövesd at the top of the Great Hungarian Plain (OROSS 2013a; MARTON 2008; MARTON / OROSS 2012; DOMBORÓCZKI 2010; KOÓS / KALICZ 2014), excavated on a larger scale under rescue conditions, suggest that some larger sites at least emerged in the second half of the sixth millennium cal BC. In turn in the first half of the fifth millennium cal BC, and generalising, there is a case for seeing a high number of locales in the Lengyel phase in Transdanubia (ZALAI-GAÁL 2010), western Slovakia and beyond (papers in KOZŁOWSKI / RACZKY 2007) as having both more substantial settlement and a more complex range of features, including enclosures and major concentrations of burials. A broadly comparable development can be seen in both the Tisza-Herpály groups to the east and in the Vinča orbit to the south (TÁLAS 1987; CHAPMAN 1981; SREJOVIĆ / TASIĆ 1990), though we note of course the development of tells in both these cases.

Neolithic population trends

This could conform to the expectation common in past research that population would have grown steadily from the beginning of the Neolithic onwards (ZIMMERMANN 1988; PETRASCH 2001; SHENNAN 2013, 301; SHENNAN ET AL. 2013, 4, fig. 2), under conditions of settled existence. It should be noted, however, that more detailed recent studies suggest, from different starting points, a more punctuated sequence and the possibility of cycles of development. Through multi-agent modelling (based fundamentally on a notion of the household), the trajectory of the LBK has been seen as ending in major, fatal disruption, caused by short-term environmental crisis leading to famine (BOCQUET-APPEL ET AL. 2014); following directional growth and outwards expansion, scenarios are being tested for the ‘eventual collapse’ of the LBK, including ‘the long-term impacts of climate and agronomic constraints, together with

assumptions about crisis contagion through the collapse of support and exchange networks or panic migration in the event of famine' (BOCQUET-APPEL ET AL. 2014, 65). Through summing of all the available radiocarbon data, a gross pattern of the rise and fall of individual cultures through time has been mooted (MANNING ET AL. 2014), and by using the density of the radiocarbon data as a proxy for population, a recurrent picture of growth and decline has been offered, including in regions of central Europe at the end of the LBK (SHENNAN 2013; SHENNAN ET AL. 2013; SEE ALSO ZIMMERMANN ET AL. 2009); speculatively, this could have been caused by 'rapid population growth driven by farming to unsustainable levels, soil depletion or erosion arising from early farming practices, or simply the risk of arising from relying on a small number of species' (SHENNAN ET AL. 2013, 4).

The Alsónyék evidence: formally modelled date estimates and their initial implications

To discuss all the problems which these suggestions raise would require another paper or more, but the now formally modelled sequence for Alsónyék contributes significantly to this debate. Neolithic settlement at Alsónyék began in 5800–5730 *cal BC* (95% probability; start: *Alsónyék Starčevo*; fig. 1), probably in 5775–5740 *cal BC* (68% probability). This settlement ended in 5575–5505 *cal BC* (95% probability; end: *Alsónyék Starčevo*; fig. 1), probably in 5560–5525 *cal BC* (68% probability). Overall, this occupation lasted for a period of 170–280 years (95% probability; span: *Alsónyék Starčevo*; fig. 2), probably for a period of 190–245 years (68% probability).

The first important estimate is that the Starčevo occupation at Alsónyék began no earlier than the beginning of the 58th century *cal BC*. The few available radiocarbon dates for Starčevo activity north of the Drava, in Transdanubia, seem to be in concordance with this timing (KALICZ ET AL. 2002; SZÉCSÉNYI-NAGY ET AL. 2015), and by comparison Körös groups north of the river Maros occupied the southern part of the Alföld roughly two hundred years earlier (WHITTLE ET AL. 2002). This also means that, according to our present knowledge, the Starčevo community at Alsónyék belonged to the first wave of migrants from the south. With its great number of features, rich in material, let alone the 30 graves, Alsónyék is the largest Starčevo site north of the Drava, probably built by newcomers immediately after their migration. It is worth emphasising that subsequent Starčevo occupation appears to have been continuous. Evidence from more than 30 Starčevo sites in Transdanubia, and especially from sites closer to the Drava, is compatible with this narrative, which is based on both these modelled date estimates from Alsónyék and the detailed analysis undertaken so far of the Starčevo pottery styles found there,

which run from rather early to the latest typological phases (Linear B to Spiraloid B, in the terms of Dimitrijević (1969)).

There was then a gap of *160–310 years (95% probability; Starčevo/LBK; fig. 3)*, probably of *200–270 years (68% probability)* before Alsónyék was re-occupied by a population employing LBK pottery.

The next intriguing point in the Alsónyék story is the end of the Starčevo occupation. The second half of the 56th century and the beginning of the 55th century cal BC are already the time of the formation of the LBK (JAKUCS ET AL. IN PREP., fig. 23). Further north-west, in western Transdanubia and in the Balaton region, we have a series of sites known from survey and one among them, Szentgyörgyvölgy-Pityerdomb, has been excavated and dated to this period (BÁNFFY 2004). These Formative LBK sites clearly overlap with the late Starčevo occupation in the Balaton region (KALICZ ET AL. 2002). This formation phase, lasting some four or five generations, does not appear to have reached southern Transdanubia. So the gap between end of Starčevo culture and the beginning of the LBK in the south-east Transdanubian Alsónyék site is yet another example supporting this observation: that the LBK expanded, after its formation, southwards and thus, what we can observe in Alsónyék is not the earliest, formative phase of the LBK (BÁNFFY / OROSS 2010).

The LBK settlement at Alsónyék was established in *5365–5230 cal BC (95% probability; start: Alsónyék LBK settlement; fig. 1)*, probably in *5335–5280 cal BC (68% probability)*. It ended in *5195–5145 cal BC (8% probability; end: Alsónyék LBK settlement; fig. 1)* or *5040–4860 cal BC (87% probability)*, probably in *5010–4915 cal BC (68% probability)*. By the time it was abandoned, this site had been occupied for *40–130 years (8% probability; span: Alsónyék LBK settlement; fig. 2)* or *240–480 years (87% probability)*, probably for *290–410 years (68% probability)*.

On the basis of these date estimates so far (with both pottery and house architecture still subject to further analysis), the next point to note is the continued settlement at Alsónyék up to the end of the LBK period in Transdanubia. This appears to have lasted for some 12–16 generations (fig. 2), though in itself such a span was probably not exceptional in the regional LBK context. The architectural remains are much less well preserved than in some LBK settlements in other regions of Transdanubia, like Balatonszárszó (OROSS 2010) and Torony (ILON 2013). The 50 timber-framed constructions were reconstructed principally from the flanking long pits. The house plans form row-like structures, each consisting of 3–5 houses. The layout of the LBK

settlement at Alsónyék seems to have many characteristics that are identical to those observed at other contemporary sites from south-east Transdanubia, such as Tolna-Mözs (MARTON/OROSS 2012) or Szederkény (JAKUCS/VOICSEK 2015). In general, LBK sites south of Lake Balaton share many similarities in both architecture and settlement plan (OROSS 2013a; 2013b).

A little to the east of the LBK settlement at Alsónyék (*fig. 4*), a community which used Sopot pottery established an enclosure and settlement in 5200–5005 cal BC (95% probability; *start: Alsónyék Sopot burials; fig. 1*), probably in 5095–5020 cal BC (68% probability). This activity ended in 4850–4680 cal BC (95% probability; *end: Alsónyék Sopot burials; fig. 1*), probably in 4825–4750 cal BC (68% probability). Overall, this settlement persisted for a period of 180–470 years (95% probability; *span: Alsónyék Sopot burial; fig. 2*), probably for 220–340 years (68% probability).

It is strikingly clear (90% probable) that the Sopot settlement was established whilst the LBK settlement was still occupied (*fig. 1*). In fact, the period of overlap when the two communities cohabited at Alsónyék lasted for –285–10 years (88% probability; *LBK/Sopot; fig. 3*) or 55–155 years (7% probability), probably for –180–40 years (68% probability). (Note that *fig. 3* shows the duration of intervals/gaps, and so this duration is shown as negative because it is a period of overlap (i.e. a negative gap).) Given the short distance (less than 1.5 km) between the sites, the people who lived in each settlement must have known each other for an appreciable period of time — several generations.

This kind of scenario of cultural overlap has not often been picked out in previous studies, in which the broad tendency has been to seek succession. Here, chronological overlap appears to have gone hand in hand with both physical separation and material difference. The two respective occupations persistently kept a certain distance from each other. The material repertoires, such as pottery and ornaments, and mortuary rites were distinctively different; Sopot pot forms and decoration contrast strongly with those of the late LBK, and a new burial rite, different from those of the LBK in Transdanubia appears, with some of the Sopot Alsónyék graves being robust, supine bodies, strongly diverging from the crouched, often more gracile forms of the LBK burials. Recently completed (but still unpublished) aDNA analyses show slightly different mitochondrial haplogroup percentages in the Sopot phase in Transdanubia compared to the LBK, and new types of Y-chromosomal haplogroups (Anna Szécsényi-Nagy, pers. comm.; SZÉCSÉNYI-NAGY 2015). These changing patterns have been taken to indicate population migration in the Sopot period. Archaeologically, Sopot groups have long been seen as

migrants from the northern Balkans who settled in Transdanubia, going northwards along the Danube, and westwards north of the Drava: a view based not only on pottery styles and decoration, but also on ornaments, physical type and mortuary rites, and on the wider Sopot geographical distribution (DIMITRIJEVIĆ 1968; MAKKAY ET AL. 1996). In the general vicinity of Alsónyék, there are major Sopot settlements on the other side of the Danube (BÁNFFY 2003). Those at Fajsz-Garadomb and Fajsz-Kovácsalom reflect long-established Sopot occupation, with material coming from a wide range of sources: pottery from the eastern part of the Great Hungarian Plain, obsidian from the north-eastern Tokaj area, red Szentgál radiolarite from northern Transdanubia and other radiolarite from the southern Transdanubian Mecsek Mountains. Initially at least, it is not difficult to read these differences at Alsónyék between the last generations of LBK culture and the first generations of Sopot culture as reflecting the active maintenance of different identities, but peaceful co-existence. In time, however, the new aDNA evidence also indicates a likely merging of populations, since the new mitochondrial and Y-chromosomal haplogroups occurring in the Sopot community persist in the Lengyel population (Anna Szécsényi-Nagy, pers. comm.; SZÉCSÉNYI-NAGY 2015).

Using the evidence of the enclosure, the burials and the well, and further indications of occupation suggested by geophysical survey, we can suggest that the Sopot settlement was extensive, like at Sormás or Petrivente, to the west of Alsónyék (BARNA 2005; HORVÁTH / KALICZ 2003). Its long duration mirrors that of the LBK settlement.

From a wider perspective, it is worth underlining that according to the currently available evidence, there is nothing in Transdanubia to support the possibility of a late LBK crisis, as argued for parts of Germany (ZEEB-LANZ 2009; GRONENBORN 2010; BOCQUET-APPEL ET AL. 2014) and as far east as Asparn-Schletz in Lower Austria (TESCHLER-NICOLA 2012). (We leave questions of the precise timings of supposed crisis events further west for discussion elsewhere.) In south-east Transdanubia, there appears to be recurrent overlap between terminal groups of the Transdanubian LBK (like Keszthely and Zseliz) and Sopot features and practices, and it can be argued that this whole interaction proceeded without major hiatuses or interruptions. This continuity as a process cannot be compared with terminal LBK scenarios further west, because while the Keszthely and Zseliz groups cover nearly the whole of Transdanubia and south-west Slovakia, the Sopot culture was distributed over a much smaller area: only along the Danube, the Drava and in discrete areas between Budapest and Lake Balaton. Out of these developments came the emergence of the Lengyel culture. To the east on the Great Hungarian Plain, the same

sort of continuity can be suggested: the formation of the Tisza culture, coming out of interaction between late Szakálhát groups and late local groups of the Alföld LBK (such as Tiszadob, Szilmege, Bükk and Esztár) (KALICZ / MAKKAY 1977; BÁNFFY 1999; NAGY 2005). The difference argued here between post-LBK trajectories, west and east, is surely related to the strong connections in the latter case with the Balkans.

The transition between the end of Sopot activity and the establishment of the Lengyel settlement at Alsónyék-Bátaszék was swift. This is estimated to have occurred in $-80-115$ years (95% probability; *Sopot/Lengyel*, fig. 3), probably in $-45-45$ years (68% probability). Again, negative values give the probability of an overlap, and positive ones the probability of a gap. It is apparent that whether there was a gap or an overlap, this transition was made within the span of the living memory of the more elderly members of the community.

On general grounds, one can suppose that there was an overlap between early Lengyel culture further to the north in Transdanubia and beyond, on the one hand, and Sopot culture in south-east Transdanubia and southward, on the other hand. The date estimates for the Sopot occupation at Alsónyék fit these general observations made from the archaeological evidence well (REGENYE 2002; BARNA 2011). The brevity of the of the Sopot–Lengyel transition at Alsónyék is noteworthy, not least in contrast to the protracted nature of the LBK–Sopot overlap there. In the Sopot–Lengyel case, perhaps this short span could be taken as further evidence of the intermingling of populations and traditions inferred from landscape use (with sites directly linked), settlement pattern, ditch systems, material culture and now also the new aDNA evidence.

The Lengyel settlement was established in $4840-4740$ cal BC (95% probability; *earliest Lengyel*, fig. 5), probably in $4805-4760$ cal BC (68% probability). It ended in $4500-4195$ cal BC (95% probability; *latest Lengyel*, fig. 5), probably in $4345-4250$ cal BC (68% probability). Overall, Lengyel occupation continued for a period of $295-605$ years (95% probability; *span: Alsónyék Lengyel*, fig. 6), probably for a period of $425-545$ years (68% probability). As described by Osztás et al. (this volume, (b), 00), the intensity of Lengyel occupation varied through time and space (*tabs 1-2*). Occupation probably began to the south and east (in sub-sites 11 and/or 5603), and endured for longest in the east (in sub-site 5603). Intense activity to the north, both burial and settlement, probably concentrated in a generation or two around 4700 cal BC (*fig. 5*). This comparatively short period saw the Lengyel settlement at its largest (c. 80 ha) extent.

For the sake of completeness, though we are not going to pursue this part of the Alsónyék story in detail here, we should note the date for the end of the Lengyel occupation, probably around 4300 cal BC. The focus here will be on site-specific and more local conditions but of course this individual site ending, dramatic and important though it must have been in itself following the previous growth of the site, was only one of a vast, complicated series of endings, abandonments and changes in the Carpathian basin and southwards beyond, in the middle centuries of the fifth millennium cal BC: one of the great but arguably comparatively neglected transformations within the development of the European Neolithic as a whole (PARZINGER 1993; LINK 2006; WHITTLE 2015; PARZINGER 2015; BORIĆ 2015). This will be discussed in other papers to come within the ToTL project, when we will present date estimates for the Lengyel sequence in Transdanubia and beyond, and also collate the results of our modelling for Alsónyék with estimates for the tells of Vinča-Belo Brdo in northern Serbia and Uivar in western Romania. The general contrast to be found everywhere is between former continuities and nucleations, as seen in tells and large flat settlements, and a shift to a very different landscape with dispersed, and perhaps largely small-scale and short-lived, forms of settlement. Locally, that is manifested in the complete abandonment of Alsónyék and regionally in south-east Transdanubia in the scattered evidence for both latest Lengyel settlement and the succeeding Balaton-Lásinja presence. The late Lengyel phase has been well investigated in the western half of Transdanubia (in Zala and Vas Counties), in some parts of northern Transdanubia (around Veszprém, and along the M1 motorway near Győr: BÁNFFY 1996; KALICZ 2001; REGENYE 2004; NÉMETH 1994) and also in eastern Austria (known as the MOG II phase and then ‘Epilengyel’: RUTTKAY 1976a; 1983-84). Although the latest, ‘unpainted’ phase of the Lengyel in south-east Transdanubia, above all in the immediate vicinity of Alsónyék, and the Balaton-Lásinja evidence are scarce, there is no reason to assume a scenario different to Transdanubia as a whole. It has been established that the Lengyel population was affected by yet another cultural (and genetic, based on new evidence) impact from the northern Balkans: this time the people carrying this impact are considered to have been the remnants of Late Vinča groups. Out of this mix of processes emerged what we call the Balaton-Lásinja culture (or, further south, the Lásinja — but that is basically the same phenomenon).

Persistent place

In relation to developments and changes in the wider world beyond, right through the timespan covered above, the Alsónyék site sequence emerges as particularly long-lasting. From our formal

estimates, Alsónyék appears to have been used overall for 1270–1575 years (95% probability; *Alsónyék duration*; fig. 2), probably for 1405–1520 years (68% probability). Taking account of the gap in occupation following the abandonment of the Starčevo settlement, Neolithic occupation at Alsónyék was actually continuous for 815–1130 years (95% probability; *Alsónyék continuous duration*; fig. 2), probably for 940–1070 years (68% probability). This is the difference between *start: Alsónyék LBK settlement* and *latest Lengyel* (fig. 1). In these terms, it can be thought of as a ‘persistent place’.

That appealing term was first applied in the context of low-intensity but recurrent use of uplands, seen in lithic depositions, by Anasazi people in the period up to ca. 1200 AD; it denotes ‘a place that is used repeatedly during the long-term occupation of a region’ (SCHLANGER 1992, 92). The term was not confined to settlements (in the original definition ‘neither strictly sites...nor simply features of the landscape’: SCHLANGER 1992, 97), but embraced physical locations with ‘concentrations of resources that make them particularly suitable for use’, and with ‘natural or cultural features that structure reuse’, and which are ‘created through practice over an extended period of time’ (MOORE / THOMPSON 2012, 268). It has been quite widely used (BARTON ET AL. 1995; DAEHNKE 2009; MOORE / THOMPSON 2012; see also CHADWICK / GIBSON 2013). Within a dwelling and relational ontological perspective, persistent places have been seen as ‘locations that structure the performance of tasks and, thus, structure the formation of organism-persons as subjects’ and as ‘more than just redundantly utilized locations; they are places where relationships are created, and as a result, identities are formed’ (MOORE / THOMPSON 2012, 269).

Wider notions of place

This ties in with wider debate about the concept of place (for example, TUAN 1977; THRIFT 2008; ANDERSON / HARRISON 2010; CRESSWELL 2015), and brings in again the notion of community. There is no need here to get bogged down in the endless discussions in the literature of place and space (reviewed in CRESSWELL 2015), and of whether place is to be confined to singular identities or can be more hybrid and more open, the ‘product of interconnecting flows’ (MASSEY 1997). It is worth emphasising, however, a broad agreement that place is meaningfully constituted (TUAN 1977, 179); ‘place is how we make the world meaningful and the way we experience the world’ (CRESSWELL 2015, 19). Place must be seen as locale — the material setting for social relations — and sense of place, as well as just location (AGNEW 1987). ‘Places gather’ (CASEY 1996, 24; cf. THRIFT 1999). In a parallel way, community is also an assemblage of people, and in the view of some, of animals and things as well (OGDEN 2011; HARRIS 2013). Community

is the outcome of interactive practice (CANUTO / YAEGER 2000), and it is symbolically constructed, ‘making it a resource and repository of meaning’ (COHEN 1985, 11); ‘community is largely in the mind. As a mental construct, it condenses symbolically, and adeptly, its bearers’ social theories of similarity and difference. It becomes an eloquent and collective emblem of their social selves’ (COHEN 1985, 114). It is useful to distinguish between what has been called ‘natural community’, a concentration of people in one place, and ‘imagined community’, the conceptualised and experienced collectivity constructed by agents (ISBELL 2000).

Persistent place and community in Neolithic Hungary and at Alsónyék

Were there general factors encouraging the creation and maintenance of persistent place and long-lasting community at Alsónyék?

Perhaps an argument can be made for the permanent physical advantages of a favourable location, strategically sited at or near to the intersection of different landscapes and ecological systems (cf. KERTÉSZ / SÜMEGI 1999; BÁNFFY / SÜMEGI 2012). The floodplain extending along the right bank of the Danube ended after a few kilometres westwards and was supplanted by forested hills, an entirely different ecological zone. The new, more Atlantic, ecological circumstances may have set an extremely hard challenge for early farmers, but at the same time have offered opportunities for adaptation, creativity and learning how to use the possibilities offered by living in such a distinctive ecotone, facing as it were two directions. The close proximity of different soil types, topographic conditions and vegetation covers, and the ecological differences between the two, must have created a distinctive, even frontier-like, setting (COLES / MILLS 1998, vii–ix; HALSTEAD / O’SHEA 1982), which may well have been one of the reasons for the persistence of the Alsónyék site.

Perhaps with the passage of time, persistence also gave a valuable sense of security and attachment (TUAN 1977, 184–7). That, however, must have been much more contingent. Alsónyék stands out as one of the most persistent places in the Neolithic of the Carpathian Basin as a whole.

In Transdanubia, we do not know of any other places with Starčevo occupations which were re-used in the LBK period, nor other LBK sites which were the locus for major Lengyel settlement, in quite the same way as at Alsónyék. LBK sites in close proximity to Starčevo ones are known, however, presumably choosing the same environment for settlement (for example Becsehely and

other cases in Zala County in south-west Transdanubia: HORVÁTH / SIMON 2003; KALICZ 1979-80; BARNA 2004). At Balatonmagyaród-Hídvégpusztá on Lake Balaton there are an early LBK and a succeeding Lengyel settlement, with a ditch system, on the same spot (BÁNFFY 1992), but there must have been a chronological gap between these occupations. At Sormás-Mántai dűlő an LBK settlement is followed by a Sopot occupation layer (BARNA 2009). But these examples really serve to underline the apparently unique sequence at Alsónyék. On the Great Hungarian Plain, likewise, continuity between Körös and Alföld LBK (or AVK) occupations appears to be slight, although both are found in broadly the same parts of the landscape (KOSSE 1979; KALICZ / MAKKAY 1977). The formation of tells there appears to be broadly confined to the first half of the fifth millennium cal BC (RACZKY 2015), though some of the earliest levels may in some cases go back to the Szakálhát phase towards the end of the Alföld LBK, at the end of the sixth millennium cal BC and the start of the fifth (RACZKY 1987; RACZKY ET AL. 1985). In northern Serbia, some Starčevo occupations became Vinča places, but no major Vinča flat site lasted through all phases of the Vinča culture (CHAPMAN 1981). (It must be noted, however, that in northern Croatia, Vinča elements often appear as filtered through the local, Malo Korenovo LBK type. At Kaniska Iva, this may be the reason why the excavator (TEŽAK-GREGL 1991) interpreted the sequence as if the Starčevo layer were immediately succeeded by the Malo Korenovo type, i.e. LBK, with Vinča elements.) Tells here were forming already in the later sixth millennium cal BC, as also in western Romania and Bosnia (SCHIER 2008; HOFMANN 2013), many going on to the period between *c.* 4700 and 4500 cal BC. This also holds true for the Alföld tells. The most prominent of all, the great mound at Vinča-Belo Brdo, began to accumulate *ca.* 5300 cal BC, was formed at a more or less even rate of accumulation over centuries of what appears to be continuous use, and was probably abandoned only in the 4540s or 4530s cal BC (TASIĆ ET AL. 2015; FORTHCOMING (a)). Interestingly, this highest of Vinča tells was preceded by a Starčevo occupation, with an intervening gap of about a century in between, in the parts of the tell so far investigated — paralleling the interval seen at Alsónyék.

Sense of place and imagined community

If Alsónyék thus really does stand out at a regional scale, how was its sense of place and imagined community constituted, and was this the same throughout the successive phases identified? A longer-term perspective, first, may be helpful.

Distinctive but varied and changing practices of settlement layout go back to the early sixth millennium cal BC. The few known Körös houses tend to lie in a row along river or oxbow

banks. Starčevo architecture and thus layout are still little known, but might be similar. Pits are arranged in rows or groups of rows, with tons of burnt daub deposited in them, and at several sites, including Alsónyék, there are rows of parallel postholes. Rows are also a feature of the architecture of the LBK, along with the new dimension of fairly rigid compass orientations, which were present from the earliest LBK houses onwards. In some northern tells such as Uivar, Csőszhalom and Herpály, houses were often (though not universally) arranged in a circle, in fact oriented to each other, leaving a central and common ground in the middle that can be understood as a central place; at Vinča-Belo Brdo and elsewhere, however, rows of houses with lanes in between were favoured. These arrangements on the tell sites must have generated a specific sense of social space.

In these tells, a visible history gradually appeared, lifting successive generations above the levels used by their predecessors, but maintaining both location and locale. That is not to claim that architecture or the layout of buildings were identical throughout tell sequences, and varying narratives of deposition and flows of material can be suggested (CHAPMAN 2000, 206–18), but the sense of direct continuity must have been palpable and powerful. At Alsónyék, by contrast, there was probably quite a different ‘feel’ (TUAN 1977, 184), from phase to phase, from the sprawling pits and the probably small wattle and daub buildings of the Starčevo occupations, through the spaced, regularly oriented and heavier longhouse constructions of the LBK settlement, to the very imperfectly known multiple ditches and other features of the Sopot site, and finally to the vast concentration of Lengyel houses, pits and graves, perhaps organised loosely in a series of neighbourhoods, but without clear lanes or streets and seemingly without central buildings or defined public spaces. Though the graves of the dead act as a thread running through the successive phases, mortuary practice is also quite varied through time (OSZTÁS ET AL., this volume (a)). There are local shifts and variations in location, both within the Starčevo phase, and in the eastwards shift of the Sopot complex overlapping with and following the LBK settlement. We can also note that on the basis of analysis so far, there are no specific indications of conscious or explicit regard for the remains of previous occupation through the prolonged persistence of place at Alsónyék.

The biography of Alsónyék is also distinctive in seemingly not, unlike some tells at least, having a steady or even development. Uncertainties about the extent of the Sopot site aside, the two striking exceptions at a regional scale are the Starčevo and Lengyel settlements. The LBK occupation, at a local or regional scale, is unexceptional, in terms of its duration, the size of its

buildings or its spatial extent. Though comparisons are hampered by very uneven research and very varied scales of excavation, Starčevo Alsónyék is so far much larger than any other known Starčevo occupation in Transdanubia (KALICZ 2011). Currently, we know of some 30 Starčevo sites in southern Transdanubia and the Balaton region (including some on its northern side), and on the basis of survey, field walking and excavation — mostly small-scale, but including some larger-scale rescue programmes — it seems that these were all small, scattered, and perhaps hamlet-like sites. To the south, however, the size of the Starčevo occupation at Alsónyék is not exceptional compared to Starčevo sites in Croatia (MINICHREITER 1992) or northern and central Serbia, such as Donja Branjevina (KARMANSKI 2005) or Galovo (MINICHREITER 2007), and further south Divostin (MCPherron / SREJOVIĆ 1988). So we can confidently say that Alsónyék, in the Danube–Drava triangle, is the furthest north of the big ‘Balkan’ settlements. It is too early in terms of post-excavation analysis to declare whether such a large site was simply first among equals or played some more prominent and defining role in a local and regional network; for what it is worth, it has been noted that the latter is often a later rather than earlier development (BANDY 2010, 22).

The Lengyel occupation at Alsónyék appears as an even more striking jump out of the path of local and regional trajectories of settlement. There are several uncertainties to take into account. Alsónyék has been excavated on a far greater scale than most other comparable sites in south-east Transdanubia and beyond. Whether it is really larger than its not distant neighbours such as Mórágypuszta-Tűzkődomb, about 6 km away, and Zengővárkony and the site of Lengyel itself, both not much more than 20 km afield, is perhaps an open question, though the extensive trial trenching at Zengővárkony (ZALAI-GAÁL 2010) may suggest a size of 40 ha, of a significantly lesser order of magnitude to Alsónyék at its height. Nor is it yet certain whether these are directly contemporary or at least partially overlap in time within the Lengyel culture of the region (ZALAI-GAÁL ET AL. 2014a; 2014b). It is a further aim of the ToTL project to provide formal date estimates for the phases of the Lengyel culture in Transdanubia and beyond with greater precision, exploiting the seriated ceramic sequence (ZALAI-GAÁL ET AL. 2014b, Abb. 43), and that work is in progress. In the discussion below, it must be remembered that it may not be Alsónyék-Bátaszék alone in the Lengyel period where unusual concentrations of people are to be found. What if, for example, there were subtle shifts between and among the four known big neighbours? Or what if — an even more intriguing and exciting possibility — all four of these sites were in partly contemporary occupation? The answer to these questions is necessarily pending, but one thing is certain — nobody expected such a large new site in the near vicinity of

the previously largest known sites in the distribution of the Lengyel cultural complex as a whole. What could be the reason for this extraordinary concentration in the Danube–Drava triangle?

Aggregation and coalescence

Aggregation and coalescence elsewhere

A useful frame of reference for thinking about the major settlement complex in the Lengyel phase at Alsónyék is provided by the many examples elsewhere, from a wide range of times and places, where major and unusual co-residential aggregations of people have been found, beyond the scale of normal villages, but without implications of urbanism. These appear not to be the outcome of internal population growth, but of ‘processes of aggregation that, by and large, involved people abandoning a regional pattern of small, dispersed settlements in favour of aggregation into larger, more nucleated settlements’ (BIRCH 2013b, 3). A plethora of other terms, including agglomeration, convergence, fusion, nucleation and coalescence (BIRCH 2013b, 3, and references), illustrates the diversity and recurrence of such situations, but this is not argued to be a universal type or evolutionary stage (BIRCH 2013b, 2), and of course size boundaries must be relative. The phenomenon appears to be global (BIRCH 2013b, 1). Striking cases come from North America, for example, including Iroquois settlements in the fifteenth–sixteenth centuries AD (BIRCH 2012; 2013a; BIRCH / WILLIAMSON 2013; TRIGGER 1976) and in the Southwest after 1000 AD (RAUTMAN 2013; WALLACE / LINDEMAN 2013), but are not confined to that continent.

Among the Iroquois, the short period from the mid-fifteenth to early sixteenth centuries saw rapid and widespread settlement aggregation (BIRCH 2012; BIRCH / WILLIAMSON 2013, 158). In the previous 150 years, there was diversity of forms and sizes of settlement dispersed across the landscape, some sites perhaps having as many as 400–500 inhabitants (BIRCH / WILLIAMSON 2013, 157). From the mid-fifteenth century, as seen in one case study of the north-central hinterland of Lake Ontario, smaller villages appear to have been abandoned and a much smaller series of significantly larger sites emerged, characterised by tightly clustered longhouses and palisaded defences. It is estimated that such larger sites could have had in the order of 1500–2000 inhabitants (BIRCH / WILLIAMSON 2013, 153). For one part of the study area, it is estimated that eight smaller communities came together to form the major Draper settlement, which itself went through five phases of expansion, with fresh longhouses, within distinctive clusters, and widening palisade circuits (BIRCH / WILLIAMSON 2013, 161). That site may have been abandoned by around AD 1480 (perhaps after only two–three decades (BIRCH 2012, 656) and following one relocation the aggregated settlement reemerged at Mantle, now with a densely packed, radial layout of longhouses and initially a central open area or plaza, all within a palisade, which went

through at least three phases of construction, just as continued house building infilled the plaza (BIRCH / WILLIAMSON 2013, 164–6). Mantle, like Draper, was short-lived, and perhaps by ca. AD 1530 it too had been abandoned (BIRCH 2012, 658).

In this specific context, the spur for aggregation appears to have widespread and increasing levels of violent conflict (BIRCH / WILLIAMSON 2013, 158). Inter-group warfare is further documented in the seventeenth-century historical record (TRIGGER 1976). It is also proposed that the process of aggregation in these circumstances threw together several different communities (perhaps ‘natural’ communities in the terms of Isbell (2000) noted above), to form short-lived, but distinctive ‘coalescent communities’ (BIRCH 2012; BIRCH / WILLIAMSON 2013, 159–64). Comparable cases have also been found widely elsewhere, and it is informative to list some of their characteristics. One important generalising review of ‘coalescent societies’ (KOWALEWSKI 2006) has listed among other things movement to new locations and collective defence; the intensification of local production and trade; elaboration of community integration through corporate kin groups and moieties; unilineal descent groups or clan systems; architecture and layouts which promote integration; universalising, collective and egalitarian ideologies and ritual practices; myths which emphasise the incorporation and ordering of groups; and an emphasis on collective or corporate leadership and discouragement of hierarchy. The sheer amount of physical labour and social effort involved has also been stressed (KOWALEWSKI 2013, 202).

If warfare is often the major spur for aggregation and coalescence, it is obviously important to reflect in turn on its varied, possible causes (KOWALEWSKI 2013, 207). That takes us to another endless debate and a correspondingly enormous literature. Suffice it to say that favourite prime movers include disruptive factors such as climate change or population growth leading to competition for scarce resources (KELLY 2000). There is also plenty of evidence, however, that conflict or warfare can on occasions be much more contingent on seemingly trivial premises, such as ‘slights, insults, marriages going wrong, or theft’ among hunter-gatherers (THORPE 2003, 160). For the seventeenth-century Huron, to the surprise of French incomers used to war being fought for territory, commercial advantage or religion, the major motivation for armed conflict was revenge for previous killings or injuries (TRIGGER 1976, 68); warfare was also the main route to prestige, position and voice for young men (TRIGGER 1976, 68–9), and that is argued to be the key cultural factor which kept conflict going (TRIGGER 1976, 145). Whatever the global variations (THORPE 2003; PERÉZ 2011), there certainly appears to be widespread evidence for a background of inter-group conflict behind major aggregations, as argued also for the substantial Ilahita village

of the Arapesh of the Sepik region, New Guinea (TUZIN 2001). It has been further suggested that Sepik villages in general, whether large or small, were a response to endemic warfare (ROSCOE 1996, 650).

There is a recurrent emphasis in these aggregations on more or less egalitarian social relations, corporate decision making and dispersed leadership (RAUTMAN 2013; MCGUIRE / SAITTA 1996). The arrangement often appears to be cellular, with clans, sodalities and moieties prominent. In the case of Ilahita, the interaction between two moieties in the operation of a secret men's cult through five grades or age-sets was a form of the 'dual organisation' found widely elsewhere (TUZIN 2001, 10–11). Clans framed by dual organisation are suggested as important for the performance of ritual and political economy in later Pueblo I villages in the American Southwest (WILSHUSEN / POTTER 2010, 181). It is important to avoid any impression of uniformity. In the case of the Iroquois of Ontario, it was suggested that Draper was 'essentially a village composed of many small villages', with each longhouse group to some extent politically and economically autonomous, while Mantle, at least to begin with, was 'much more integrated and pre-planned' (BIRCH 2012, 661). Conflict and antagonisms within and between wards and moieties at Ilahita led eventually to unresolved disputes which caused 'disgruntled parties' to move away (TUZIN 2001, 120–1). At Mantle, one substantial segment of the community appears to have left after a while, causing extensive rebuilding (BIRCH / WILLIAMSON 2013, 166). For Martinez Hill in southern Arizona, aggregation was suggested as a 'necessary but temporary solution to some societal problem or problems' (WALLACE / LINDEMAN 2013, 147), leading to a regionally very large site, but with plenty of internal difference and relative lack of integration (WALLACE / LINDEMAN 2013, 148). The assortments of people thrown together tended to create an inherent fragility. This could be managed by practices of social and ritual integration, but was always likely to lead to break-up and abandonment. No doubt durations varied, but the 'brittleness of the social linkages' (GILMAN 2010, 138) appears to have recurrently effected this sooner rather than later. Pueblo I villages in the Four Corners lasted only decades (GILMAN 2010, 138).

Aggregation and coalescence in the Lengyel period at Alsónyék?

Although much more could be said about every aspect of aggregation and coalescence, the brief review above serves to set a series of pertinent questions for the understanding of Alsónyék in the Lengyel phase.

We have considered above the persistence of Neolithic activity in the locality of Alsónyék. We now consider the intensity of that occupation through time. All that follows must be considered in the light of ongoing post-excavation analysis, which can only refine the picture presented here in the future. The bases of our estimates are, however, explicit.

We begin by taking the cumulative probabilities of the posterior density estimates for the start and end of each phase of occupation presented in the period-based papers in this volume. The cumulative probability that a settlement has ended is subtracted from the cumulative probability that it has started to provide the probability that it was in use. These distributions have then been normalised and aggregated into 25-year bins (being approximately equivalent to a human generation), to form distributions which represent the probability that a particular feature from a particular phase dates to a particular generation.

But not all settlements have the same intensity of occupation, and in the Lengyel settlement it is clear that occupation was more intense in some areas at some times (OSZTÁS ET AL., this volume, (b), 00). Consequently, we have weighted these distributions using estimates of the total number of features in each period at Alsónyék. The uncertainties of this process are variable.

For the Starčevo occupation, we have a clear indication of the extent of the site to the east of the excavated area available from geophysical survey (OROSS ET AL., this volume (a), *fig. 1*), but to the south a railway track prevents any inference of its extent. Our estimates for the Starčevo occupation will thus be slightly low. Much of the area of the LBK settlement was excavated (ca. 88%), although uncertainties in this case relate to the interpretation of further features not associated with longhouses to the north-west of the main settlement (OROSS ET AL., this volume (b), *fig. 1*), and to the current extent of post-excavation analysis. (At the time of writing, post-excavation analysis had only been undertaken on the easternmost part of the excavated area of the LBK settlement (ca. 6% of the whole excavated area). The number of features has thus been extrapolated proportionately from this small sample.)

For the Sopot period, the excavated sample is very small (c. 4%) and, although the extent of the enclosure is apparent from geophysical survey, it is not clear what proportion of the multi-period palimpsest of other anomalies shown indicate features of Sopot date. Our estimate for this period is certainly the least reliable of those proposed. In *tab. 3* and *fig. 7* we have extrapolated the number of Sopot features from the excavated area (39) across the area of activity shown in

and around the Sopot enclosure by geophysical survey. This provides an estimate of 924 for the total number of Sopot features in this area.

Given the temporal and spatial variation in the intensity of occupation of the Lengyel site, we have analysed each sub-site (and graves and settlement features) separately.

Notwithstanding the uncertainties outlined above, this analysis clearly shows an extraordinary intensification of activity at Alsónyék at the start of the Lengyel period (*fig. 7*). The number of features increases from ca. 150 in the generation before 4800 cal BC to ca. 7,600 in the generation before 4700 cal BC. This is something like a 50-fold increase in the intensity of activity. And this intensification happened very quickly — within the space of the generation or two who lived in the middle of the 48th century cal BC. Such intensification was not sustained and, by the generation before 4600 cal BC, the number of features had reduced to ca. 600. This represents something like a 12-fold decrease from the peak of activity a century before, but still indicates occupation four times more intense than any that had occurred at Alsónyék before the Lengyel period. The peak of activity at Alsónyék was perhaps sustained for only a generation or two, and the decline was perhaps only slightly slower than its rise (covering two or three generations in the latter part of the 47th century cal BC). Activity did not reduce to its pre-Lengyel levels, however, until ca. 4300 cal BC.

Within the *longue durée* of Alsónyék as a persistent place, the Lengyel occupation clearly emerges as an episode, dramatic in scale but of limited duration. It would not have appeared so to the inhabitants of the settlement for whom 50 years was a long time (if not a lifetime). Someone whose grandparents were babies when their parents built a new house in subsite 11 in the 4760s cal BC, might well have had no remembrance of a pre-aggregated settlement when they dangled their grandchildren on their knee in the still-bustling settlement of the 4650s cal BC. We thus now consider what our new chronologies can tell us about the population dynamics of Alsónyék, and the kinds of lives experienced by its inhabitants.

We begin by considering the osteoarchaeological evidence for the number of people who died in the Lengyel settlement, using three alternative methods to estimate its population.

For the first method initially we consider only adult burials, because it is clear that we do not have a complete sample of the children who died (only ca. 23%, whereas historical records for

pre-industrial populations suggest that a figure closer to 40% would be expected) (ACSÁDI / NEMESKÉRI 1970). To obtain an estimate of the number of adult deaths from each subsite of the Lengyel settlement, we increase the number of adult skeletons recovered in proportion to the estimated unexcavated area of the subsite (*tab. 4*). These deaths are then proportioned across the normalised probability distributions for the presence of the cemetery in each subsite in each generation to provide an estimate of the number of adult deaths in the settlement through time (*fig. 8; tab. 5*). We then multiply the estimated total number of adult deaths in each generation by 40% to account for the children, and calculate the population over time using a variety of mortality rates derived from historical accounts of pre-industrial populations (30–40 deaths per annum per 1,000 population for normal mortality, and 60–80 deaths per annum per 1000 population for crisis mortality; ACSÁDI / NEMESKÉRI 1970). This method provides estimates of the population of the Lengyel settlement through time (*fig. 9; tab. 5*).

The second method is that of Acsádi and Nemeskéri (1970). We used the number of recorded adult and child deaths in the burial assemblage for each subsite (859 for subsite 10B and 647 for subsite 5603 (the osteological analysis of subsite 11 is ongoing)). We then multiply the number of deaths (D_x) by the life expectancy at birth (e_x^0), and divide it by the duration of the cemetery (t) with a correction factor (k) of 10%. In this case the duration of the cemetery is well known. We have used the median of the duration of burial in each subsite, derived from the models presented by Osztás et al. (this volume, (b), *figs 12–13 and 18–19*): 279 for subsite 5603 and 24 for subsite 10B. Life expectancy at birth is 22.1 years in subsite 10B and 31.8 years in subsite 5603. The total number of deaths is corrected for the missing children in the death assemblage, using the proportion of children observed and an appropriate life-table (BERNERT 2005; COALE / DEMÉNY 1966). This provides us with an average estimate for the population who lived in different areas of the settlement (*tab. 6*).

The third method is that of Ubelaker (1999). This calculates the population by multiplying the number of deaths (N) by 1000. This is divided by the mortality rate multiplied by the duration of the cemetery. In this case no allowance is made for the error on our estimate of cemetery duration (we have just used the median values listed above). We have used a mortality rates of 45.25 (calculated from a life-expectancy at birth of 22.1 years) for subsite 10B, and 31.43 (calculated from a life-expectancy at birth of 31.8 years) for subsite 5603. The total number of deaths is corrected for the missing children in the death assemblage as described above. This

method again provides us with an average estimate for the population who lived in different areas of the settlement (*tab. 6*).

We can compare the population estimates for subsites 10B and 5603 using the three different methods. The first method estimates changes in population over the period when the settlement was in use, and so is not directly comparable to the other methods which estimate on average how many people lived at the same time on the site. For subsite 10B, we compare the clear peak in population estimated by Method 1, using the upper limit of the normal mortality rate (40 deaths per annum per 1,000 population). This estimates that 1,239 people including children were living on sub-site 10B in the generation before 4700 cal BC. The estimate provided for this area by Method 2 is 2,157 people, and is 2,373 by Method 3. These estimates are clearly divergent, apparently because the median duration for subsite 10B (24 years) places the entire population of this area in a single generation. If we consider the aggregated total population for subsite 10B calculated by Method 1, which is 2,743, the results of the various methods are more comparable. For subsite 5603, where there is no clear peak in population, we average the population estimates from Method 1 between *c.* 4750 and 4550 cal BC (270) for comparison with those provided by Method 2 (268) and Method 3 (296). Generally, these comparisons convince us that our analysis is broadly believable.

These people lived in substantial timber houses, which ranged in size from 14 m by 22 m to 6 m by 8 m. Traces of 120 houses were recovered in the excavated area of the Lengyel settlement, and we estimate that a total of 294 more probably exist in the unexcavated areas (*tab. 7*). Overall the population of Lengyel Alsónyék lived in just over 400 houses over the whole period of the site's occupation.

In order to consider how many houses were standing at any one time, however, it is necessary to estimate for how long houses were in use. This is difficult. The maximum duration is obviously provided by the duration of settlement in a particular subsite (*fig. 6*), but houses need not have stood for this long. In subsite 10B at Alsónyék, where settlement continued for *1–45 years (95% probability; use: 10B – Settlement Pits; fig. 6)*, probably for *1–20 years (68% probability)*, for example, in several cases a succession of two houses has been recorded. Taking the median of the duration for occupation in this area (11 years), this would give an average duration of less than a decade for the use of each house. This estimate is obviously based on very little evidence. It can be compared, however, with the durations calculated for a series of eight houses (dating between *ca.*

5150 and ca. 4750 cal BC) through the tell at Uivar, Romania (DRAȘOVEAN ET AL. FORTHCOMING). The median durations of these structures range from 11 years to 82 years, with a median of 40 years. Similarly, we have formal date estimates for the duration of eleven houses (dating between ca. 5300 and ca. 4500 cal BC) from the tell at Vinča: Belo Brdo, Serbia (TASIĆ ET AL. 2015; FORTHCOMING (b)). The median durations of these structures range from four years to 55 years, with a median of 19 years.

Consequently we have estimated the number of houses occupied in Lengyel settlement at Alsónyék through time using the median value of the (admittedly scant) data that are currently available for the duration of Neolithic houses in south-east Europe (25 years). This provides the estimate shown as a bar chart in *fig. 10*, and suggests that the settlement consisted of c. 210 houses in the generation before 4700 cal BC, reducing to under ten houses in the generation before 4500 cal BC (*tab. 8*). This estimate is sensitive to the average house duration used in the calculations (see the variability shown by using the varied median house-durations of 19 and 40 years in *fig. 10* and *tab. 8*). For the present, however, we think that the estimate based on a house-duration of 25 years is to be preferred since this is based on at least some explicit, quantified estimates for houses of similar kind to those found in the Lengyel period at Alsónyék.

In considering how many people inhabited each house, we need to consider whether the entire population was buried on site for the whole of the settlement's duration. The estimated number of houses occupied at any one time in different areas of the Lengyel settlement (using an average house duration of 25 years) is plotted against the estimated population of the settlement (using a mortality rate of 40 deaths per annum per 1,000 population) in *fig. 11*. Although both the settlement and cemetery were clearly at peak intensity in the generation before 4700 cal BC and the overall trends are very similar, there are differences in detail. In particular, burial seems to have continued slightly later on subsite 10B than did settlement, and settlement on subsite 5603 continued for substantially longer than burial. We therefore estimate the number of inhabitants of the houses only for the generations before 4700 cal BC and before 4600 cal BC (after this point inhumation on the site appears to have declined in popularity). Using a mortality rate of 40 deaths per annum per 1,000 population, this gives us a total household size of between ten and 18 (including four–eight children). This can be compared with a cross-cultural anthropological estimate suggested by (Naroll 1962) where household size is approximately one tenth of the floor area of a house. The average floor area of a Lengyel house at Alsónyék was 126 m², and so this method would suggest an average household of 12–13 individuals.

The rise and fall of the Lengyel settlement at Alsónyék can be summarised based on this analysis. On the site of an already existing Lengyel cemetery, a small settlement may have been established in the earlier 48th century cal BC, with a population of ca. 100 individuals constituting a handful of households. In the decades before 4700 cal BC, this settlement exploded to more than 200 houses, with a population of perhaps 2,500 individuals. The following century saw rapid decline, with the settlement ca. 4600 cal BC containing around 15 houses which were inhabited by around 350 people. The decline continued and by ca. 4500 cal BC, the population had declined to around 200 individuals who lived in under ten houses. By ca. 4400 cal BC, the settlement had shrunk back to fewer than a hundred people in a handful of households.

In all these respects, Alsónyék can surely be linked with the aggregations discussed above. All the terms used in this paper, from hamlet through village to aggregation, are in the end relative, but the jump in the size of Alsónyék in the Lengyel period seems decisive. How far then can we take this general alignment with phenomena better known from other times and places?

What, first, can we say about possible causes for the Alsónyék aggregation? In many of the cases noted above, troubled times and the threat or reality of violence were a major spur to aggregation, and aggregations regularly appear to far exceed the outcome of normal, local population growth; aggregation is regularly accompanied by the abandonment of preceding, smaller settlements. In the present state of research, these dimensions are hard to follow in detail.

There is one striking potential case of violence in an early Lengyel context within Transdanubia. At Esztergályhorváti in the Kis-Balaton region of south-west Hungary, the remains of 38 people were found packed into an irregular, relatively small and incompletely excavated pit, sealed by an intensely burnt layer (BARNA 1996; BRONK RAMSEY ET AL. 1999). Young adult males predominated. Body positions and treatment were varied, with prone burials most common. Four individuals appeared to have had their arms pinned behind their backs, and three had *peri-mortem* cranial trauma made by axes. While this deposit could be seen as the aftermath of inter-group conflict, it might also be explained as some form of ritual killing (BRONK RAMSEY ET AL. 1999, 202; BARNA 1996, 156; ZOFFMANN 2007), and these competing possibilities need to be examined carefully and critically (PERÉZ 2011). No other identical mortuary deposits are known in Transdanubia, but it is important to see Esztergályhorváti in the wider context of rather varied

and unusual mortuary practices in the more westerly part of the Lengyel distribution. These include the remains of multiple individuals, mutilated skeletons, partial burials with skeletons without heads or only skulls, and mixtures of human and animal remains (BÁNFFY 1986; RUTTKAY / TESCHLER-NICOLA 1985; URBAN 1979). In Moravia, at Rajhrad near Brno, a pit or grave discovered in the 1870s contained the bodies of five people and a pig, along with sherds of Moravian Painted Ware, and a further skull was found beside the pit (WANKEL 1873). This has also been considered a candidate for signs of group-scale conflict, though other explanations could again apply (ČERMÁKOVÁ 2007). There appears to be little systematic evidence so far for inter-personal violence in the Lengyel cultural context as a whole.

The skeletons from subsites 10B at Alsónyék have been studied in detail, and a very low incidence of trauma thought to result from inter-personal violence has been observed (under 1.5 percent for both men and women; other injuries vary between age classes, though rising to over 10 percent for mature adults, but these are thought to relate to a whole range of accidental causes, rather than to violence: Kitti Köhler, pers. comm.; KÖHLER 2012, tables 103–4; 2013). Those that survive of the many skeletons excavated previously from sites within reach of Alsónyék, such as Mórág-Tűzkődomb and Zengővárkony, have not yet been systematically examined for trauma, in the way that has been carried out for other samples of Neolithic mortuary populations (SCHULTING / FIBIGER 2012; BICKLE / WHITTLE 2013), but extensive examination has certainly been carried out (ZOFFMANN 1968; 1970; 2004; 2014; KÖHLER 2007). The same low incidence of trauma has been observed at Mórág (ZOFFMANN 2004; Kitti Köhler, pers. comm.; KÖHLER 2012; 2013), and skull trauma were anyway found in only two cases at Esztergályhorváti (ZOFFMANN 2007). There is still the question of what such percentages might mean, as it has been estimated that many wounds and trauma might not show on the human skeleton (ORTNER 2003, 119). So it is possible that we underestimate the incidence of violent encounter from the Neolithic human skeletal evidence, but at face value, inter-personal or inter-group violence does not currently appear to be a major feature of the later Lengyel period in south-east Transdanubia.

A number of substantial enclosures, defined by both ditches and palisades, are known, from south-east Transdanubia and beyond, including Lengyel itself some 32 km from Alsónyék (ZALAI-GAÁL 1990a; 1990b; BERTÓK / GÁTI 2014). As far as is known, the ditch on the edge of Alsónyék itself is relatively slight and it is not known if it was continuous; it was only excavated in two places, and did not appear as a feature in the parts of the site subject to geophysical

survey. Further afield, there are ditched and palisaded enclosures in the Lengyel orbit which belong to the *rondel* or *Kreisgrabenanlage* category; one of the closer examples is the two-phase Svodín in southern Slovakia (NĚMEJCOVÁ-PAVÚKOVÁ 1995). There are dozens of Lengyel rondels in south-east Transdanubia (BARNA ET AL. 2015). Two enclosures have been discovered recently in the neighbouring Somogy County (OSZTÁS ET AL. 2004), but one of them may represent a different type to the rondels, and probably had a defensive function (SOMOGYI 2007). It is an open question whether those, however, can be seen as defensive circuits rather than ritual arenas (VENCL 1999, 69; BERTÓK / GÁTI 2011, 24; BARNA ET AL. 2015, 84).

It is important not to overlook the perforated stone axes which occur in so many Lengyel graves in Transdanubia (ZALAI-GAÁL ET AL. 2014a). These occur overwhelmingly in adult male graves (ZALAI-GAÁL ET AL. 2014a, 100–2, tab. 10). Could these have had, like LBK adzes and axes, before them, multiple uses, as tools, markers of age and position, and also weapons, as seen in the cranial trauma at Talheim (WAHL / KÖNIG 1987)? The Lengyel perforated axes could certainly suggest a world which knew inter-personal and inter-group violence, but on their own they do not perhaps pick out the later Lengyel phase as markedly more extreme than earlier times. Tools which doubled as weapons are in a tradition going back to the LBK, suggesting perhaps endemic and episodic conflict rather than regular warfare, but the debate on the end of the LBK should be noted (SCHULTING / FIBIGER 2012; MEYER ET AL. 2014). A ‘clear diachronic trend’ was claimed some time ago ‘of increasing frequencies and diversities of both ‘weaponry’ and defences’ (CHAPMAN 1999, 141), but we underline the paucity of the evidence so far for violence at the end of the LBK in Transdanubia, and Esztergályhorváti remains the only candidate for inter-group violence, coming from the early Lengyel phase. At Alsónyék itself, we note the date estimates presented in *Coalescent community at Alsónyék: the timings and duration of Lengyel burials and settlement* for a peak in the deposition of axes in graves in the generations either side of 4700 cal BC, and a subsequent decline in numbers.

It is hard, finally, to put Alsónyék into its regional settlement context. We know that there were other large sites in the area, within a radius of some 30 km, as also discussed in *Coalescent community at Alsónyék: the timings and duration of Lengyel burials and settlement*. Those have been picked up by earlier discovery and excavation. But how many smaller and dispersed sites wait to be revealed by systematic field survey and aerial photography? Given the numbers of Lengyel rondels discovered by aerial photography (ZALAI-GAÁL 1990a; 1990b; BERTÓK / GÁTI 2011), many more associated settlements seem probable, even if research to establish this remains to be

completed. Where more detailed investigation of shifts in settlement distribution at a comparable time has been carried out, for example in the Dévaványa region of the Körös river basin on the Great Hungarian Plain, it is interesting to note the suggestion of nucleation into bigger sites accompanied by the abandonment of earlier, smaller and more dispersed locations (MAKKAY 1982; SHERRATT 1983a; 1983b), but it remains to be established in any detail whether a similar process can be seen in Transdanubia. Indeed, the enormous density of Lengyel settlements and ditch systems in the vicinity of Alsónyék has never been interpreted and structured at a landscape scale, and stands out as a future research priority.

Even if its immediate causes remain unclear, what kind of aggregation might be represented at Alsónyék in the Lengyel period? Could this be a coalescent community in the terms discussed above? Again in advance of the completion of all the many post-excavation studies currently in progress, it is hard to give any definitive answers, but it is important to set the questions. As things stand, there is no obvious sign of formally defined central open areas — though not every part of the excavated areas is covered by Lengyel buildings or pits — or unusually large central buildings, nor of overtly planned layouts. One tentative suggestion at this stage of post-excavation analysis is of a series of neighbourhoods, defined by loose clusters of houses, pits and groups of graves, which grew ‘organically’ rather than in planned fashion, albeit swiftly, and without clear boundaries between one cluster and the next. Neither the archaeological evidence for building replacements or repairs nor the chronological models produced by this study suggest great time-depth in the biographies of such putative neighbourhoods, though the life at the site endured in the case of 5603 for at least 400 years after the main floruit of the settlement. But the sudden and prodigious jump in size estimated above was so great that this surely cannot be the effect of local population growth, and the recent aDNA studies do not suggest major population change at this date (SZÉCSÉNYI-NAGY 2015). So it is currently very plausible that Alsónyék should be thought of as some kind of coalescence, formed from previously dispersed and smaller local and perhaps regional settlements and communities. In these terms, one possible comparison might be the character of the Iroquois Draper site, a set of smaller villages making up one large settlement, rather than the more integrated and pre-planned Mantle site (BIRCH 2012), but we are conscious of the dangers of plucking single analogies from a very wide range of other possibilities.

To begin to get under the skin of this putative coalescence, we could do worse than start with households. Just as with ‘village’ and ‘aggregation’, this is another relative term; household size,

composition and concentration in single buildings or distribution across several structures are all very varied (SOUVATZI 2008). The size and spacing of the Lengyel period houses at Alsónyék could suggest autonomous households, and the population estimates given above would certainly have provided sufficient labour, house by house, for an effective economic unit. At this stage of analysis, however, it is difficult to argue that each house must have constituted an independent household (cf. TRINGHAM / KRSTIĆ 1990), and groups of households (however precisely housed, and whether or not their composition fluctuated) could have formed close-knit neighbourhoods, offering a larger economic unit and more labour. Especially if the economy in the peak of Lengyel period activity at Alsónyék stretched far out into the surrounding landscape, as discussed below, the labour pool may have been crucial, not just for subsistence, for work in the fields, and for perhaps far-ranging herding (DAHL / HJORT 1976; RUSSELL 1998; HALSTEAD 2014) and hunting (compare again BIRCH / WILLIAMSON 2013) — further isotope studies on the animals are an obvious target in future research — but also for the maintenance of the exchange networks seen in the flow into the settlement of *Spondylus*, copper and other items. On the perhaps fragile basis of comparison with the cross-cultural estimates of household size given by Naroll (1962; and see above), it might even be the case that Lengyel-period houses at Alsónyék were themselves rather densely inhabited: perhaps full houses (using the upper end of our estimates above) going with the packing represented by the aggregation as a whole. That could have been beneficial for the provision of labour, but might have provided its own source of tensions. In this regard, it is perhaps no surprise that cattle should, on the basis of analysis so far, have been the dominant species at Alsónyék, since its consumption — given the quantities of meat involved — often seems to demand a large number of people, for whom feasting could have been an important social bond (MARCINIAK 2005).

Could we think further beyond households in terms such as clans and wards, beyond or overlapping with neighbourhoods, and even of overarching organising structures such as moieties? Those are recurrent and important features of the historical and ethnographic cases sketched above. Could we identify sufficient difference, in architecture, mortuary practice or subsistence, among and between different parts of the Alsónyék site, to suggest something more of the character of the putative coalescence as well? Again, we have to state rather cautiously that at this stage of research there is much which it has not yet been possible to examine in close detail. But there may already be clues, and further analysis will surely throw up others. Just from the chronological models given above and in the period-specific paper (*Coalescent community: the timings and duration of Lengyel burials and settlement*), it is evident, first, that the foci of activity shifted

around the settlement through time, and there could be interesting principles of seniority to follow in future research. It may be the case that activity began in the first place with the digging of graves, on subsite 5603 or subsite 11 (OSZTÁS ET AL., this volume (b), *tab.* 7), precedence thus being established in the mortuary sphere and perhaps harder for successors to challenge.

The two most richly furnished graves both come from Grave Group 23 on subsite 10B (and thus date to ca. 4700 cal BC). These graves contained a man (3060: ZALAI-GAÁL ET AL. 2011) and a woman (1473: ZALAI-GAÁL ET AL. 2010, 314–15, 319, Abb. 12a–b). With the body were a large aurochs trophy, a large set of polished stone axes, one of the largest stone knives ever found in the Carpathian basin, *Spondylus* and *Dentalium* ornaments, and copper beads. The woman in grave 1473 has comparably abundant grave goods, especially of *Spondylus* and *Dentalium*. Some differences between adjacent grave groups are already evident, such as in the contrasting body orientations, noted in *Coalescent community: the timings and duration of Lengyel burials and settlement*, in grave groups 13, 14 and 15 in subsite 10B. Though the sample is tiny and not entirely random, the apparent concentration of dated axes around 4700 cal BC (OSZTÁS ET AL., this volume (b), *fig.* 30) could speak to the importance of display among peer groups at the peak of the occupation aggregation. Even at this stage of initial description, there are other clues to difference among and between the grave groups, such as the greater abundance of finds with four-post construction graves in the northern part of subsite 10B compared to subsite 11; the subtle variations in Grave Groups 61 and 61A, with rows beginning to form in some places but not others; or the varying durations among Grave Groups 56–59 and 61–68 (OSZTÁS ET AL., this volume (b), 00). It will be for more detailed analysis in the future to evaluate this further.

If we do not yet know what brought Alsónyék together so quickly, nor do we understand the conditions of its swift decline. It is worth remembering that our estimates given above suggest that even at the end of its life, the rump of Lengyel settlement at Alsónyék was still bigger than in any of the earlier phases of occupation; whatever the possible causes, it seems clear that Alsónyék was not abandoned straightaway. In general comparative terms, we could suggest all manner of possible causes for decline, including rivalries, defeat in warfare, rapidly changing political circumstances and environmental processes (among many others: BANDY / FOX 2010; BIRCH 2013A; BOCQUET-APPEL ET AL. 2014; DIAMOND 2005; SCHWARZ 2013; SHENNAN ET AL. 2013; TAINTER 1988; 2006). There are the practical considerations of how the substantial population would have been supported by an extensive, regional economy, and whether the new arrangements necessary would have been sustainable (cf. BIRCH / WILLIAMSON 2013). It is worth

noting the abundance of red deer and aurochs, on the basis of zoological analysis so far, suggesting wide-ranging activity far out into the landscape. With reference to the challenge of living well together in an aggregation or a coalescence, we could also think of the high probability, again from a comparative perspective, of tensions within and among people brought rapidly together into a single, larger community. The timescales over which such tensions could be endured — often, not for long, in ethnographic and historical cases — have been extensively discussed above.

Could there also have been some other kind of specific cause of decline, of relatively minor significance say in its own right, but which nonetheless might have had considerable knock-on effects? Could, for example, the signs of tuberculosis in Grave Group 13 at Alsónyék be something that knocked the possibly very sensitive balance of an over-populated and tension-ridden community? Both the troubling symptoms of the disease and subsequent deaths might have been enough to cause fear and to initiate an at least partial dispersal from the aggregation, even if according to the chronological models given above and in the previous paper there was no immediate abandonment of the site overall. A comparatively small cause could have had major consequences. Indications of the perhaps quite extensive presence of tuberculosis at Hódmezővásárhely-Gorzsa in the south of the Great Hungarian Plain, from a broadly comparable date to Lengyel Alsónyék (MASSON ET AL. 2015), could suggest that this was a widespread problem faced by many contemporary communities.

Final reflections and future research

In these papers, we have given formally modelled estimates for the chronology of the whole, long development of the Alsónyék settlement. That has provided further formal estimates of the durations of each phase, and of the varying gaps and overlaps between phases. The prolonged occupation of Alsónyék shows a strikingly persistent place, one in fact which currently stands out within the Neolithic of Hungary and beyond in the Carpathian basin as exceptional.

Our formal models also help to reveal the tempo of change seen in the Alsónyék sequence, within which our estimates suggest particularly an extraordinary surge in the size of the settlement and the numbers of people involved, in the Lengyel period; correspondingly, the decline from the peak of Lengyel intensity was almost as swift as its rise. The models help us further to outline a changing sense of place and the character of what has been called imagined community, especially but not only in the major aggregation — as we have argued, on

comparative grounds, a coalescent community — represented by the Lengyel settlement. We have considered possible general conditions for the persistence of place at Alsónyék, and we have canvassed possible specific causes for both the rapid emergence and the swift decline of the Lengyel coalescence, though here both the incomplete post-excavation research at Alsónyék and the still very patchy knowledge of the local and regional settlement pattern preclude any clear answers at this stage. Despite these frustrating remaining uncertainties, we can nonetheless add the evidence from Alsónyék as yet one more important constituent in the wider history of changes and endings in the 47th and 46th centuries cal BC, in the Carpathian basin and south-east Europe as a whole.

If there is still much that is unclear, and even though future research could well produce alternative interpretations and estimates to those presented here, what we have offered in these papers not only represents a considerable advance in our understanding but also helps to define key priorities for the future. Some elements of the post-excavation programme have been concluded, such as the chronological modelling reported here and the aDNA analyses referred to above, but as set out in the introductory paper a long list of other studies await completion. Beyond those tasks, there is much work to do on the wider Lengyel culture chronology in Transdanubia (ZALAI-GAÁL ET AL. 2014b), to which the ToTL project will also be contributing, and on the further detail of the regional settlement context and sequence. In those ways, ultimately, the Alsónyék story will contribute at its fullest to the broader history of the Neolithic in the Carpathian basin and in the neighbouring regions of both central and south-east Europe.

Summary · Zusammenfassung · Résumé

SUMMARY Drawing on the papers in this volume that precede it, our discussion brings all the chapters of the long story of Alsónyék into a single narrative, discussing in more interpretive terms notions of persistent place, community, aggregation and coalescence, with an eye on different scales of analysis and the broader tempo of change. We look especially at the remarkably long persistence of Alsónyék, the intensity of its occupation and the trajectory of population increase and decline at the site.

We begin by comparing general conditions of early village emergence with the specific evidence for the development of settlement and population in Transdanubia and beyond in central Europe, before summarising date estimates for the successive periods of occupation at Alsónyék itself, from Starčevo through LBK and Sopot to the Lengyel. We emphasise the long continuity

of occupation except for the gap between Starčevo and LBK, the probable overlap between LBK and Sopot, and the acceleration of growth in the Lengyel period. The exceptional persistence of place seen at Alsónyék is examined in further detail, with comparison to elsewhere leading on to discussion of the sense of place and community that may have been experienced through the Alsónyék sequence. Characterisation of the Lengyel occupation as not only a major aggregation but also a coalescent community is explored; the causes of such developments elsewhere, as seen in the historical and ethnographic record, are noted, including periods of social instability and inter-community violence. The extraordinary intensity of activity at Alsónyék is further modelled in various ways to provide estimates of population and numbers of buildings in use through the Lengyel sequence. The peak of intense activity was probably only maintained for a generation or two around 4700 cal BC, and the decline of the Lengyel site was perhaps only slightly slower than its rise (covering two or three generations in the latter part of the 47th century cal BC). Activity did not reduce to its pre-Lengyel levels, however, but persisted for several more centuries at perhaps two or three times the intensity of any pre-Lengyel occupation.

A search for the causes of the Alsónyék aggregation — and of its decline — remains challenging, though answers may eventually be found in the further study of the regional settlement complex or the detailed history of disease. No extensive signs of violence have so far been recorded. We further discuss possible constituents of the coalescence represented at Alsónyék, noting the frequent houses and possible households and neighbourhoods, and looking beyond these to the idea of wards, clans and moieties. Possible clues to internal differences within the site are noted for future research, and it is only with further work that the full Alsónyék story can be told.

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Figure captions

Fig. 1. Probability distributions for the start and end of the settlements of different cultural groups in the Alsónyék landscape (distributions are taken from models defined in Oross et al., this volume (a), fig. 6; Oross et al., this volume (b), fig. 7; Oross et al., this volume (c), fig. 6; and fig. 5 below).

Fig. 2. Probability distributions for the number of years the settlements of different cultural groups in the Alsónyék landscape were inhabited (distributions are taken from models referenced in fig. 1; *span: Alsónyék Lengyel* = difference *earliest Lengyel* and *latest Lengyel*; *Alsónyék duration* = difference *start: Alsónyék Starčevo* and *latest Lengyel*; *Alsónyék continuous duration* = difference *start: Alsónyék LBK settlement* and *latest Lengyel*).

Fig. 3. Probability distributions for gaps/overlap between the settlements of different cultural groups in the Alsónyék landscape (*Starčevo/LBK* = difference *end: Alsónyék Starčevo* and *start: Alsónyék LBK settlement*; *LBK/Sopot* = difference *end: Alsónyék LBK settlement* and *start: Alsónyék Sopot burials*; *Sopot/Lengyel* = difference *end: Alsónyék Sopot burials* and *earliest Lengyel*).

Fig. 4. Estimated location and extent of occupation of different cultural groups in the Alsónyék landscape.

Fig. 5. Probability distributions for the start and end of different areas and activities of in the Lengyel settlement (from the models defined in Ostzás et al. this volume (b), figs 12–13, 15–16 and 18–19). The distributions for the first (earliest) and last (latest) Lengyel activity have been calculated from these distributions.

Fig. 6. Probability distributions for the number of years the different areas and activities in the Lengyel settlement at Alsónyék-Bátaszék endured (from the model defined in Ostzás et al. volume (b), figs 12–13, 15–16 and 18–19); *span Alsónyék Lengyel* = difference *earliest Lengyel* and *latest Lengyel*).

Fig. 7. Number of features per generation at Alsónyék, calculated from the normalised probability distributions for the use of each phase of settlement (*see text*; derived from the models defined in Oross et al. this volume (a), fig. 6; Oross et al., this volume (b), fig. 7 Oross et al., this volume (c), fig. 6, and Ostzás et al., this volume (b), figs 12–13, 15–16 and 18–19)) and the estimates of settlement area and feature numbers provided in *tab. 3*).

Fig. 8. Estimated number of adult deaths at Alsónyék ca. 5000–ca. 4400 cal BC (note: a small number of LBK deaths would be expected in the generations before 4900 cal BC).

Fig. 9. Estimated population of the Lengyel community at Alsónyék ca. 4900–4500 cal BC (based on the estimated number of adult deaths shown in *tab. 5*, increased by 40% for children, with the mortality rates indicated).

Fig. 10. Estimates for number of houses in occupation in the Lengyel settlement at Alsónyék through time (grey bars: 25-year house duration by subsite).

Fig. 11. Estimated number of houses inhabited in different subsites of the Lengyel settlement at Alsónyék (25-year house duration), and estimated population (following Method 1, upper range of normal mortality).

Tables

Table 1. Highest Posterior Density intervals for the start and end of different areas and activities in the Lengyel settlement (from the model defined in Ostzás et al. this volume (b), figs 12–13, 15–16 and 18–19).

<i>Parameter</i>	<i>Highest Posterior Density interval (95% probability)</i>	<i>Highest Posterior Density interval (68% probability)</i>
<i>start: 10B - Cemetery</i>	<i>4740–4685 cal BC</i>	<i>4715–4690 cal BC</i>
<i>end: 10B - Cemetery</i>	<i>4705–4640 cal BC</i>	<i>4695–4670 cal BC</i>
<i>start: 11 - Cemetery</i>	<i>4820–4730 cal BC</i>	<i>4795–4745 cal BC</i>
<i>end: 11 - Cemetery</i>	<i>4635–4480 cal BC</i>	<i>4585–4515 cal BC</i>
<i>start: 5603 - Cemetery</i>	<i>4815–4725 cal BC</i>	<i>4790–4740 cal BC</i>
<i>end: 5603 - Cemetery</i>	<i>4530–4440 cal BC</i>	<i>4515–4465 cal BC</i>
<i>start: 10B - Settlement Pits</i>	<i>4735–4695 cal BC</i>	<i>4720–4700 cal BC</i>
<i>end: 10B - Settlement Pits</i>	<i>4715–4680 cal BC</i>	<i>4710–4690 cal BC</i>
<i>start: 11 - Settlement Pits</i>	<i>4780–4660 cal BC</i>	<i>4745–4690 cal BC</i>
<i>end: 11 - Settlement Pits</i>	<i>4680–4525 cal BC</i>	<i>4670–4620 cal BC (37%) or 4610–4565 cal BC (31%)</i>
<i>start: 5603 - Settlement Pits</i>	<i>4805–4625 cal BC</i>	<i>4745–4665 cal BC</i>
<i>end: 5603 - Settlement Pits</i>	<i>4520–4475 cal BC (3%) or 4450–4185 cal BC (92%)</i>	<i>4345–4245 cal BC</i>

Table 2. Highest Posterior Density intervals for the durations of different areas and activities in the Lengyel settlement (from the model defined in Ostzás et al. this volume (b), figs 12–13, 15–16 and 18–19).

<i>Parameter</i>	<i>Highest Posterior Density interval (95% probability)</i>	<i>Highest Posterior Density interval (68% probability)</i>
<i>use: 10B - Cemetery</i>	<i>1–95 years</i>	<i>1–40 years</i>
<i>use: 10B - Settlement Pits</i>	<i>1–45 years</i>	<i>1–20 years</i>
<i>use: 11 - Cemetery</i>	<i>120–325 years</i>	<i>175–270 years</i>
<i>use: 11 - Settlement Pits</i>	<i>1–225 years</i>	<i>35–175 years</i>
<i>use: 5603 - Cemetery</i>	<i>215–355 years</i>	<i>240–315 years</i>
<i>use: 5603 - Settlement Pits</i>	<i>175–580 years</i>	<i>335–490 years</i>

Table 3. Estimates for proportion of occupation areas of different periods, excavated and unexcavated (with estimates of numbers of features excavated and unexcavated). (For the Lengyel occupation we have excluded the estimated number of postholes from the houses since these would anomalously inflate the estimated number of features for this period. Although 50 houses have been identified in the LBK settlement, generally this was done on the basis of the associated long pits, and few postholes survived.)

Ceramic group	Excavated area (m²)	Unexcavated area (m²)	Proportion excavated	Excavated features	Unexcavated features	Total features
Starčevo	25,651	21,745	ca. 54%	500	424	924
LBK	46,152	6,424	ca. 88%	818	114	932
Sopot	3,165	71,836	ca. 4%	39	885	924
Lengyel (10B)	93,923	189,197	ca. 33%	2,800	5,640	8,440
Lengyel (11)	60,687	193,174	ca. 24%	1,000	3,183	4,183
Lengyel (5603)	32,808	98,740	ca. 25%	1,280	3,852	5,132

Table 4. Estimates for proportion of occupation areas of different periods, excavated and unexcavated (with estimates of numbers of adult burials excavated and unexcavated).

Ceramic group	Excavated area (m²)	Unexcavated area (m²)	Proportion excavated	Excavated adults	Unexcavated adults	Total adults
Sopot	3,165	71,836	ca. 4%	10	227	237
Lengyel (10B)	93,923	189,197	ca. 33%	650	1,309	1,959
Lengyel (11)	60,687	193,174	ca. 24%	586	1,865	2,451
Lengyel (5603)	32,808	98,740	ca. 25%	510	1,535	2,045

Table 5. Estimated number of adult deaths in the Lengyel community at Alsónyék ca. 4850–4450 cal BC.

Modelled date	Estimated adult deaths				Estimated population	
	5603	11	10B	Total	Normal mortality (30–40 deaths per annum/1000)	Crisis mortality (60–80 deaths per annum/1000)
4850–4826 cal BC	3	10	0	13	15–25	5–15
4825–4801 cal BC	13	50	0	63	85–120	40–60
4800–4774 cal BC	58	207	2	267	370–500	180–250
4775–4751 cal BC	135	402	19	556	770–1,040	380–520
4750–4724 cal BC	179	476	172	827	1,150–1,550	570–780
4725–4701 cal BC	181	465	886	1,532	2,140–2,860	1,070–1,430
4700–4676 cal BC	181	416	696	1,293	1,800–2,420	900–1,210
4675–4651 cal BC	181	325	127	633	880–1,190	440–600
4650–4524 cal BC	181	73	42	296	410–560	200–280
4625–4601 cal BC	181	21	13	215	300–410	150–210
4600–4576 cal BC	181	5	3	189	260–360	130–180
4575–4551 cal BC	181	1	1	183	250–340	120–170
4550–4524 cal BC	178	0	0	178	240–340	120–170
4525–4501 cal BC	139	0	0	139	190–260	95–130
4500–4476 cal BC	58	0	0	58	80–110	40–55
4475–4451 cal BC	13	0	0	13	15–25	5–15

Table 6. Average estimate for the population of different areas of the settlement at the height of their use, following methods proposed by Acsádi / Nemeskéri (1970) and Ubelaker (1999).

Ceramic group	Acsádi / Nemeskéri (1970)		Ubelaker (1999)	
	Excavated	Weighted for unexcavated	Excavated	Weighted for unexcavated
Lengyel (10B)	719	2,157	791	2,373
Lengyel (5603)	67	268	74	296

Table 7. Estimates for proportion of occupation areas of different periods, excavated and unexcavated (with estimates of numbers of houses excavated and unexcavated).

Ceramic group	Excavated Area (m ²)	Unexcavated Area (m ²)	Proportion excavated	Excavated houses	Unexcavated houses	Total houses
Starčevo	25,651	21,745	ca. 54%	0	0	0
LBK	46,152	6,424	ca. 88%	50	7	57
Sopot	3,165	71,836	ca. 4%	0	0	0
Lengyel (10B)	93,923	189,197	ca. 33%	71	143	214
Lengyel (11)	60,687	193,174	ca. 24%	23	73	96
Lengyel (5603)	32,808	98,740	ca. 25%	26	78	104

Table 8. Estimates for number of houses in occupation at Alsónyék ca. 4725–4700 cal BC, and ca. 4525–4500 cal BC (estimated using house durations of 19 years, 25 years and 40 years).

Average house duration	Estimated number of houses (ca. 4725–4700 cal BC)	Estimated number of houses (ca. 4525–4500 cal BC)
19 years	157	5
25 years	207	7
40 years	330	11